Parents' and Children's Gendered Beliefs About Toys and Screen Media

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Abstract

Contemporary discussions around gender roles, stereotypes, and play highlight the need for updated research on the influences of children's early play experiences and learning (Weisgram, 2018). Different types of play relate to different skills and vary by gender, such as spatial play and spatial skill (Jirout & Newcombe, 2015; Voyer, Voyer, & Bryden, 1995), and very little is known about gender and digital play. This study assessed parent and child gendered beliefs about play preference and ability with spatial and non-spatial toys and screen media, parent-rated educational value of toys, and frequency of child play (N = 60 parent-child dyads; M_{age} = 5.5) Though parents reported some stereotypical beliefs, especially for preferences, they considered screen media neutral. Children's responses only related to parents' for spatial preference, and were egocentric across toy types. Ratings of educational value related to play frequency and were lower for screen media than physical toys. Additional results and implications are discussed.

Keywords: children, play, gender, stereotypes, spatial play, screen media

Parents' and children's gendered beliefs about toys and screen media

Much of childhood is spent in play, which is the product of children's environment and culture (Pellegrini & Smith, 2003; Vygotsky, 1967). Play is also an important socializer of beliefs about gender (Leaper & Friedman, 2007; Weisgram & Dinella, 2018), with play experiences and beliefs about play influenced in part by parental beliefs (Sigel & McGillicuddy-De Lisi, 2002) and societal norms (Weisgram, 2018). Importantly, playful activities can also be important for more academic learning (Zosh et al., 2018), with specific types of play relating to different academic skills, such as spatial thinking (e.g., Jirout & Newcombe, 2015; Verdine, Golinkoff, Hirsh-Pasek, & Newcombe, 2014) and numerical knowledge (e.g., Ramani & Siegler, 2008; Starkey, Klein, & Wakeley, 2004). Understanding the factors that lead to differences in children's play experiences is crucial, and has particular relevance for areas like spatial play where gender differences are apparent (Jirout & Newcombe, 2015; Levine, Ratliff, Huttenlocher, & Cannon, 2012). In light of contemporary views about gender and technology-based changes to what play looks like in childhood, updated research is needed to understand parents' and children's gendered beliefs about play (Brown & Stone, 2018).

While some traditional physical toys are timeless, children now spend much of their time engaged with and learning from digital devices (Rideout & Robb, 2020). An increasingly wide range of activities, from reading stories to playing games, are taking place through almost universally available smartphones or tablets. New research is needed to understand the changing landscape of children's beliefs about play as a result of new technology. In recent years, there has also been a noticeable shift in public sentiment surrounding gender-typed toys. For example, in 2015, the major retailer Target announced the removal of gender labeling from their toy section after receiving backlash for signage that read "Building sets. Girls' building sets."

(Target Corportation, 2015). Other companies followed suit, indicating a broader shift in how many families now approach gender and play. Attention at the level of the federal government and the involvement of numerous international toy and media companies demonstrate the importance and relevancy of issues surrounding gendered play (The White House, O. of the P. S, 2016; Weisgram, 2018).

This paper aims to address gaps in the literature by exploring parents' and children's gendered beliefs about different types of toys and whether parents' and children's beliefs relate to each other, as well as to children's frequency of play with different toy types. We explore both beliefs about play ability and preference for spatial, non-spatial, and screen-based play. By examining influences on children's early playful experiences and extending this to screen-based interactions, this research offers practical implications for supporting learning through play.

Parents' beliefs about play and toys

An important component of children's gender socialization is the toys to which they are exposed. Parents' beliefs about gender and toys may contribute to gender disparities in play by leading them to make different toys available (Fisher-Thompson, 1993; Kim, 2002; Leaper & Farkas, 2015; McHale, Crouter, & Whiteman, 2003), and promote different experiences and skill-development during play (Wood, Desmarais, & Gugula, 2002), depending on the gender of their children. More broadly, gender stereotype beliefs relate to the development of self-concept (Eccles et al., 1993; Tiedemann, 2000) and even have long-lasting effects on career choices in young adulthood (Lane, Goh, & Driver-Linn, 2012).

Past research shows that adults reinforce gender-stereotyping of children's toys (Fisher-Thompson, 1990; Masters & Wilkinson, 1976). For example, they consider toys described as nurturing, creative, and attractive to be more appropriate for girls, whereas constructive,

aggressive, and competitive toys are considered more appropriate for boys (Miller, 1987). When asked to rate the gender appropriateness of a wide range of toys, both parents and non-parents rated stereotypically feminine toys (e.g., Barbie, doll house, Easy Bake Oven) as more highly appropriate for girls than stereotypically masculine toys (e.g., toy soldiers, race car, Power Rangers) were for boys (Campenni, 1999). In other words, they claimed that "girl toys" were most acceptable for girls, but that "boy toys" were somewhat acceptable for girls too. Parents also rated more toys as gender-neutral than did non-parents, suggesting that greater experience with children may influence parent perceptions about gender appropriateness, perhaps because many children do not conform to strict gender norms.

Toy selection is also likely influenced by parent's perceptions of the educational value of both the toy and the play experience. For example, maternal beliefs about the educational value of play relate to how often their children engage in play (Fisher, Hirsh-Pasek, Golinkoff, & Gryfe, 2008). Specifically, mothers who define a broad variety of activities as "play" (e.g., engaging with dolls or building blocks, running outside, reading, using a computer) place greater educational value on play activities, and have children who play more often. In contrast, mothers who define play more narrowly, including unstructured activities but not structured activities (i.e., engaging with dolls/building blocks or running outside was considered play but not reading or using a computer), attributed less educational value to play and their children engaged in less play of both structured and unstructured types. In a qualitative study, mothers argued that their children learn cognitive skills, like conceptual development about the world, and social skills, like cooperation, through their play behavior (Colliver, 2016). Thus, if parents believe certain forms of play better stimulate learning, they may encourage it in their homes.

Similarly, parents' beliefs about screen media affect their children's media engagement. Parents with more positive views of screen media have children who spend more time using screen media (Cingel & Krcmar, 2013; Vandewater et al., 2007). Parent views about children's use of screen media may relate to their own use. Parents who are more comfortable using digital media themselves report more frequent media use by their children (McCloskey et al., 2018). But many parents hold mixed views about the educational potential of screen media. In a nationally-representative survey conducted in the United States, 67% of parents said their children's media use helps their learning a lot or a little, yet 76% also strongly or somewhat agreed with the statement "The less time kids spend with screen media, the better off they are" (Rideout, 2017). Since play increasingly involves digital tools, parents' opinions about the value of screen media has direct implications for children's play behavior in general, and more specifically their learning through play.

Parents' beliefs about play likely influence their children's beliefs and play behavior (McHale et al., 2003), but it is important to assess multiple aspects of parents' and children's beliefs to gain an accurate picture of how gender stereotypes are reinforced (Kollmayer, Schultes, Schober, Hodosi, & Spiel, 2018). While much prior work focuses on toys as either masculine or feminine, or on the "appropriateness" of toys for either gender, in the present study we separate beliefs into those related to children's abilities and those related to children's preferences. Parents' beliefs or perceptions of gender appropriateness might influence their decisions about which toys to purchase (Fisher-Thompson, 1993), with parents believing their children will prefer gender-stereotypical toys (Kollmayer et al., 2018). Yet children also make decisions about the toys they consider appropriate and can be equally enthusiastic about same-, neutral-, or cross-gendered toys (Idle, Wood, & Desmarais, 1993). Theories of gender

development, such as social cognitive theory and cognitive-developmental theory, argue for the importance of social models (e.g., parents) in setting the stage for children's broader understanding of gender roles in society (Bussey & Bandura, 1999; Martin, Ruble, & Szkrybalo, 2002). By observing the gender-stereotypical actions of others, children develop beliefs and expectations that guide their own gender identity and behavior (Martin et al., 2002), so it is important to study children's beliefs along with their parents'. While there is strong support for relations between parents' and children's toy choices and more general gender beliefs (Degner & Dalege, 2013; Eisenberg, Wolchik, Hernandez, & Pasternack, 1985; Tenenbaum & Leaper, 2002), some research suggests that parents are inaccurate in predicting their children's sex-typed play choices (Schau, Kahn, Diepold, & Cherry, 1980). Thus, it is worthwhile to study the relation between parents' and children's beliefs about play and relate these to reported frequency of play.

Children's beliefs about play and toys

Children's gendered preferences during play appear as early as the second year (Martin & Ruble, 2009). In general, children prefer to play with same-sex peers (Maccoby, 1990), and expect other children to do the same (Martin, Fabes, Evans, & Wyman, 1999). Children also tend to choose gender-stereotypical toys (Fisher-Thompson, 1993). As young as one year old, girls play more with stereotypically feminine toys like dolls and tea sets whereas boys play more with stereotypically masculine toys like construction sets and cars (Servin, Bohlin, & Berlin, 1999). At ages 3 and 5, girls show more interest in masculine toys than they previously did but continue to favor feminine toys over masculine toys, and boys show decreasing interest in feminine toys as they grow older. These observed toy preferences are aided by the presence of explicit gender labels. For example, children presented with novel gender-neutral toys prefer the ones they are

told are liked by their own gender, and they predict other children will have similar preferences (Martin, Eisenbud, & Rose, 1995). Even highly attractive toys are judged as less desirable if they were labeled as being for the opposite gender. Gender labels can also be subtle, like the color of a toy. Pink is strongly associated with and chosen by girls but avoided by boys (LoBue & DeLoache, 2011). When stereotypically masculine and feminine toys are given non-stereotypical colors (e.g., a pink and purple monster truck, a blue and red tea set), boys mainly choose masculine toys, but girls show interest in masculine toys with feminine colors (Weisgram, Fulcher, & Dinella, 2014).

Research on children's gendered beliefs about toys has primarily focused on children's own preferences, often using categories of 'masculine' and 'feminine' as determined by adult ratings. The current study aims to extend this work to examine children's more general ideas about toys and gender, as well as relations between parents' and children's gendered beliefs about toys. Furthermore, prior research has often focused on a wide range of toys and play activities, yet certain types of play are particularly valuable for learning. Extensive research suggests that spatial play with toys like blocks, puzzles, shapes, and board games is related to the development of spatial reasoning (Jirout & Newcombe, 2015; Verdine et al., 2014), which is important for achievement in science, technology, engineering, and math (STEM) domains (e.g., Shea, Lubinski, & Benbow, 2001; Wai, Lubinski, & Benbow, 2009). This research also shows that boys play more with spatial toys than girls (e.g., Jirout & Newcombe, 2015), that these toys are historically considered to be 'masculine' (e.g., Fisher-Thompson, 1990), and that boys outperform girls on several types of spatial thinking (Levine, Foley, Lourenco, Ehrlich, & Ratliff, 2016). For this reason, we were especially interested in exploring beliefs about spatial play in the current study. Below, we overview evidence of the relation between spatial play and

spatial abilities, gender differences that favor males in spatial abilities, and the possibility that spatial play contributes to these differences.

Spatial play and developing spatial skills

Spatial play can benefit children's development of spatial skills and support their learning and success in STEM subjects (Verdine et al., 2014; Wai et al., 2009). For example, when children build structures out of blocks or put together puzzles, they must consider the shape, dimensions, and orientation of an object in relation to other objects and, often, compare physical objects to a visual representation, like when following step-by-step building block instructions or using an image of a completed puzzle. In other words, they use spatial reasoning skills to think about objects, their features and shapes, their relations to other objects, and their movement through space (Newcombe & Shipley, 2015). Engaging in such thinking through play might help children practice spatial skills that underlie essential STEM concepts (Jirout, Holmes, Ramsook, & Newcombe, 2018; Uttal, 2000; Verdine et al., 2014), leading to later interest in and ability to learn in STEM domains (Gold et al., 2018). For example, mental rotation is practiced when considering if pieces of a jigsaw puzzle might fit together when oriented differently and is also valuable to understanding how chemical molecules fit together.

Engagement in a variety of spatial play activities is associated with higher spatial reasoning skills. Brosnan (1998) found that children who successfully completed building a Lego bridge model scored higher on a mental rotation measure than those who did not. Levine et al. (2012) showed that children who played with puzzles more frequently between the ages of 2 and 4 years performed better on a mental transformation task when they were 4 ½ years old. Jirout and Newcombe (2015) demonstrated that children who played most often with blocks, puzzles, and board games scored higher on general spatial ability than children who played less frequently

with them in a large, nationally representative sample of 4-7-year old children, and Casey et al. (2008) found that a block building intervention improved kindergarteners' spatial visualization. This prior work also showed higher play quality and frequency of play for boys compared to girls (Jirout & Newcombe, 2015), though quality was only predictive of spatial skills for girls (Levine et al., 2012). Experimental work supports the potential for spatial play to reduce gender differences in performance (Casey, Erkut, Ceder, & Young, 2008), and research suggests similar patterns for digital spatial games, such as Tetris (De Lisi & Wolford, 2002) and a pentominoes game (Yang & Chen, 2010), with girls "catching up" to boys' performance levels. Importantly, early spatial play experience can predict adult spatial skills (Nazareth, Herrera, & Pruden, 2013), and even mediate gender differences in spatial performance (Gold et al., 2018). This, along with consistent gender differences in some early spatial skills (Lauer, Yhang, & Lourenco, 2019; Voyer et al., 1995), demonstrates the importance of exploring early gender beliefs and spatial play.

The present study

The literature discussed above suggests that parents hold beliefs about gender-appropriateness and educational values for toys and these beliefs are likely learned by children and influence their play experiences. This can result in different play experiences between boys and girls, such as boys playing more with spatial toys (and potentially developing higher spatial skills as a result). There are several limitations to past research on gendered beliefs about toys that the present work addressed. First, much of the prior work took place 20 or 30 years ago and societal shifts in the nature of play and gender necessitate a new examination of parents' perceptions of toys. Parents' beliefs are dynamic systems, influenced by factors like their cultural ideologies, values, socialization goals, and personal experiences (Sigel & McGillicuddy-De Lisi,

2002), so we would expect changes over time in their beliefs about play. Indeed, some research demonstrates shifts in gendered perceptions of toys to more neutral perceptions (Blakemore & Centers, 2005; Wood et al., 2002). In addition, past work has relied on adult ratings, largely excluding children's ratings, to categorize toys (e.g., Blakemore & Centers, 2005; Cherney & London, 2006), and these studies used general ratings of femininity or masculinity of toys. Thus, it is not clear whether these ratings indicate beliefs about children's own abilities and/or preferences with different types of toys.

The current study extended prior work by describing whether parents continue to hold similar gendered beliefs about spatial and non-spatial play, or if beliefs have become more neutral. We further extended prior research by comparing ratings of ability and preference rather than simply 'masculinity' and 'femininity' ratings, comparing parents' beliefs to children's beliefs, and testing for relations with reported frequency of play and perceived educational value across play types. We also explored screen media in addition to specific types of physical play, which has not been included in prior studies. Our research questions were:

1. Do parents and their children display gendered beliefs about children's preference for and ability with different toy types, and do parent and child beliefs relate? We expected both parents and children to claim a male preference for and advantage with spatial play in comparison to non-spatial play. We did not hold prior expectations about gender beliefs for screen media. We also expected a relation between the beliefs of parents and children, due to the bidirectional nature of parents' and children's belief systems and the role of the family in gender socialization.
2. Do boys show a higher preference for spatial toys than girls, as indicated by selecting a spatial toy as their favorite from an array of toy types? We expected that boys would

choose spatial toys more frequently than girls because spatial toys like blocks and construction sets have often been classified as masculine and boys' more frequent spatial play could be an indicator of preference.

3. Do parents' beliefs about the educational value of play differ by toy type? Although parents claim that children can learn from their use of screen media, they also believe children should spend less time with screens; thus, we expected that parents would believe that play with physical toys is more valuable for learning than screen media use.
4. Does children's frequency of play with different toy types, as reported by parents, relate to parents' beliefs about the educational value of different toy types and children's preferred toy type? We expected that parents' beliefs about the educational value of play would positively relate to their children's frequency of engaging in that play. We further expected that children's favorite toy type would serve as an indicator of their general toy preferences and would thus relate to their frequency of play with that type of toy.

Method

Participants

Child-parent dyads were recruited from visitors at a children's museum or from an existing participant database, with data collection continuing until we reached our target sample of 60 dyads (exclusions included 8 children outside of the target age range and 11 dyads in which the parent did not complete the questionnaire). Child participants (ages 4.0–6.8, M = 64.94 months, SD = 10.82; 50% female) were predominantly Caucasian and middle class, reflecting the community from which they were recruited. Parents were of similar demographics, but age and gender were not recorded. Parents consented to their own and their child's participation

according to an approved IRB protocol. Legal guardians were not distinguished from biological parents and both are here referred to simply as parents.

Measures and procedure

Data collection took place either in a lab setting or at a children's museum. Children participated in a brief picture task, described below, while parents completed a questionnaire. In the museum, parents were approached by a researcher and told about the study and invited to participate if children appeared to be in the target age range. All invited children were given the chance to participate and were excluded if their age fell outside of the target range.

Parent belief questionnaire. Parents completed a 2-page questionnaire that asked about their general beliefs about children's play and their own children's engagement with various toys and activities (see Appendix A). The toys and activities were blocks, books, dolls/stuffed animals, balls, drawing materials, building toys, puzzles, television, computers, and tablets/ smartphones.[1] Parents rated each of the toys/activities for whether they "are preferred more by boys or girls" using a nine-point Likert-type scale the label "No Difference" centered over the "5" and gender anchors for 1 and 9. Then they rated the same toys/activities for "whether boys or girls are more skilled" using the same scale. Next, parents reported the frequency of their own child's play for each toy/activity on a six-point scale (several times a day, once a day, several times a week, once a week, several times a month, once a month or less). Finally, parents rated the educational value of each toy/activity on a scale of 1 (not important) to 10 (extremely important).

For each type of question (e.g., preference questions, ability questions), responses were averaged across the categories of spatial toys, non-spatial toys, and screen media. The spatial

[1] An additional activity – outside play – was included in the parent questionnaire, which was designed as part of a larger study, but was excluded from all analyses in the present study.

toys were blocks, puzzles, and building toys, the non-spatial toys were books, drawing materials, balls, and dolls/stuffed animals, and the screen media were television, computers, and tablets/smartphones. These toys and activities were chosen to reflect a range of common spatial and non-spatial toys and screen media. Most of these toys are considered by adults to be gender-neutral[2] (Blakemore & Centers, 2005; Wong & Yeung, 2019; Wood et al., 2002), despite older studies finding a range of gendered classification. For analyses, gender belief ratings were centered around zero with a full range of − 4 to +4; negative values reflected stronger boy preference/ability and positive values reflected stronger girl preference/ ability.

Child belief measure. Child participants chose between a boy or girl for each of 16 items on a forced-choice measure. For each item, the image of a toy or activity (e.g., blocks, a tablet) was presented on one page above another page with pictures of a boy and a girl (see Figure. 1 for example trial, and Appendix B for all spatial and non-spatial toy images used). Child pictures were from the Child Affective Facial Expression (CAFE) set and were matched for race/ethnicity and emotional expression for each item (LoBue & Thrasher, 2015), with the left/right orientation counterbalanced across items. The items were the same for all participants and were not matched to participant's race but included a range of race/ethnicities: White non-Hispanic, Black non-Hispanic, White Hispanic, Black Hispanic, North Asian, and South Asian. In the first set of 8 items, which assessed gendered beliefs about ability, children were told that "one of these friends is really good" at playing with the toy/activity and asked to show which one (see Figure. 1). If the child pointed to both pictures or said both, that was permitted and recorded. Similar wording was used for all eight trials in that set, which included three spatial (puzzles, blocks, building toys), three non-spatial (balls, books, drawing toys), and two screen media items (computers,

[2] Specific neutral items included the following toys: books, puzzles, wooden blocks, balls, crayons, Legos.

touchscreens).[3] Next, children saw the same faces and similar items represented with new images (e.g. a different book), with pairing and order changed, and were given similar prompts using "really liked" instead of "really good at" to assess gendered beliefs about preference. Then, children saw a page with seven of the play materials (computer was not included) and were asked which they would most like to play with the most. Last, children saw an image of a tablet and a smartphone together and were asked whether they played with touchscreens.

Similar to parents' ratings, children's gendered scores for ability and preference were averaged across spatial toys, non-spatial toys, and screen media items. A score of − 1 was given for any boy faces chosen, +1 for any girl faces chosen, and 0 if children indicated no difference (e. g., pointing to or saying "both"); thus, average scores ranged from − 1 to 1, with negative values indicating stronger male choice and positive values indicating stronger female choice.

Results

We first assessed parents' and children's gender beliefs about ability and preference for spatial toys, non-spatial toys, and screen media, and asked whether parents' and children's gender beliefs relate. Next, we examined gender differences in children's own toy preferences. We then examined whether parents' beliefs about the educational value of play differed by toy type. Finally, we tested correlations between children's play frequency with different toy types and parents' beliefs about the educational value of these toy types and children's toy preferences.

Parents' and children's gender beliefs about ability and preference

Across all toy types, both parents' and children's average gender ratings were neutral (parents M = − 0.06, SE = 0.03; children M = 0.00, SE =0.06). We tested whether average preference and ability ratings differed from zero (neutral) for spatial and non-spatial toys and

[3] Some items on the parent questionnaire were excluded from the child measure to reduce the number of trials for children and avoid fatigue.

screen media for parents and children, adjusting our p-value of 0.05 based on running these six comparisons to be 0.008 (see Figures. 2 and 3 for all rating means).

Parent beliefs. Figure. 2 shows all means and standard errors of preference and ability parent ratings. Parent ratings differed from zero toward a male preference for spatial toys ($M = -0.27$, $SE = 0.08$), $t(59) = -3.61$, $p = .001$, $d = 0.47$, and toward a female preference for non-spatial toys ($M = 0.25$, $SE = 0.06$), $t(59) = 4.30$, $p < .001$, $d = 0.55$. For ability, parent ratings differed from zero toward females for non-spatial toys (M = 0.15, $SE = 0.05$), $t(59) = 3.11$, $p = .003$, $d = 0.40$, while spatial toys were neutral ($M = -0.03$, $SE = 0.06$), $t(59) = -0.55$, $p = .585$, $d = 0.07$. Parents' gendered beliefs about screen media were neutral for both preference ($M = -0.05$, $SE = 0.03$), $t(59) = -1.92$, $p = .060$, $d = 0.25$, and ability ($M = -0.02$, $SE = 0.03$), $t(59) = -0.48$, $p = .635$, $d = 0.02$. In fact, parent ratings of screen media preference and ability were almost exclusively neutral – only 4 of the 60 parents rated any screen media type as being gendered for preference, and only 5 rated any screen media type as being gendered for ability, and these ratings were close to neutral. For this reason, we chose not to further analyze parent gendered ratings of screen media, as any effects observed would be driven by a small percentage of participants.

We ran a repeated-measures ANOVA with measure (preference or ability rating) and toy types (spatial, non-spatial) as within-participant factors to test the difference in parents' gender beliefs about ability and preference for the different toy types. A significant measure by toy type interaction was observed, $F(1,59) = 13.08$, $p = .001$, $\eta_p^2 = 0.18$; main effects of measure $p < .001$, $\eta_p^2 = 0.28$, and toy type $p = .098$, $\eta_p^2 = 0.05$. Parent ratings were more gendered for preference (see Figure. 2), but this difference was only significant for spatial toy ratings ($p = .002$; non-spatial toys $p = .054$).

Children's beliefs. Children did not hold gendered beliefs about preference or ability for any toy types (see Figure. 3 for means and SEs; *p*-values ranged from 0.24–1.00). However, analyses testing for differences between boys' and girls' ratings showed a significant difference. Using a repeated-measures ANOVA, toy type and rating type (preference or ability) were treated as repeated measures, and child gender as a between-subject variable. There was a main effect of children's gender on ratings (boys: $M = -0.26$, $SE = 0.08$, girls: $M = 0.24$, $SE = 0.08$), $F(1,58) = 20.65$, $p < .001$, $\eta_p^2 = 0.26$, indicating that children consistently chose their own gender as having higher preference and higher ability across toy types (see Figure. 3). Measure type (preference or ability) did not differ across the different toy types (main effect of measure $p = .427$; no significant interactions, all p values >.2).

Relation between parent and child beliefs. Parents' and children's gendered beliefs were positively correlated for spatial toy preference using Spearman rank-order correlations, $r_s = 0.28$, $p = .033$. Their beliefs were not correlated for spatial toy ability $r_s = 0.05$, $p = .693$, non-spatial toy preference $r_s = 0.07$, $p = .580$, or non- spatial toy ability $r_s = 0.07$, $p = .587$.

Gender differences in children's toy preferences

Our second research question asked whether boys would be more likely to choose a spatial toy as their favorite. We found that almost half of the children chose the touchscreen devices as the play material they would most like to engage with ($N = 25$; 14 boys, 11 girls). The next most popular choice was the drawing materials ($N = 12$; 2 boys, 10 girls), followed by the building toys ($N = 9$; 9 boys), ball ($N = 8$; 4 boys, 4 girls), puzzle ($N = 3$; 3 girls), blocks ($N = 2$; 1 boy, 1 girl), and books ($N = 1$; 1 girl). By toy category, non-spatial toys were more popular than spatial toys (non-spatial $N = 21$; 6 boys, 15 girls; spatial $N = 14$; 10 boys, 4 girls). A chi-square test indicated that the pattern of preference across the toy types differed between boys and girls, X^2

(2, N = 60) = 6.789, p = .03. Girls chose a non-spatial toy significantly more often than did boys, X^2 (1, N = 60) = 5.934, p =.015; gender difference for spatial toy choice: X^2 (1, N = 60) = 3.354, p =.07. Boys and girls were equally likely to choose screen media, X^2 (1, N = 60) =0.617, p =.432.

Parents' beliefs about the educational value of play and relation to toy type

Our third research question was whether parents' beliefs about the educational value of play differed by toy type. We found that overall, parents rated the educational value of all toys/activities relatively high on the 10-point scale (M = 7.49, SE = 0.13). A repeated-measures ANOVA with degrees of freedom corrected for unequal variances demonstrated that ratings differed across toy type, F(1.30, 76.68) = 100.62, p <.001, η_p^2 = 0.63. Parents believed that spatial toys had the highest educational value (M =8.51), followed by non-spatial toys (M = 8.31), and screen media (M = 4.72). Pairwise contrasts were only significant for spatial and non-spatial difference from screen media (p-values < .001, using Bonferroni correction; spatial and non-spatial did not differ, p =.616).

Play frequency and its relation to parents' beliefs and children's toy preference

Lastly, we examined relations between children's frequency of play (as reported by parents) and parents' beliefs about the educational value of toy types and children's preferred toy type. Across items, the average frequency of play across all toy types was "several times a week" (M = 4.14, SE = 0.07). A repeated-measures ANOVA with toy type as a within-subject factor showed that average frequency differed across toy types,[4] F(1.6, 97.0) =28.43, p <.001, η_p^2 = 0.33, with non-spatial toy frequency (M = 4.88, SE = 0.09) significantly higher than spatial (M =

[4] This result was confirmed with a Friedman test of related-samples comparing rank distributions; X^2 (60) = 44.42; p < .001; non-spatial toys differed from both other types, p-values <.001.

3.70, *SE* = 0.14), $p < .001$, and screen media (*M* = 3.62, *SE* = 0.15), $p < .001$ Spearman rank-order correlations show that parent beliefs about the educational value of play and parent-reported frequency of children's play were correlated for screen media, $r_s(60) = 0.39$, p = .002, and non-spatial play, $r_s(60) = 0.26$, $p = .042$, but not spatial play, $r_s(60) = 0.17$, $p = .19$. Parents who rated screen media and non-spatial toys as more educational reported their children played with those toys more frequently. We found no difference in frequency of each type of play across children's self-reported preferred toy type (all *p*-values >.133).

Discussion

There are many ways by which parents impact their children's gender development and learning from play, such as through toys made available and encouragement of play with gender-stereotyped toys (Caldera, Huston, & O'Brien, 1989; Fisher-Thompson, 1993; McHale et al., 2003; Weisgram & Dinella, 2018), so it is important to study parents' beliefs about different types of toys, especially those found to be beneficial for supporting later learning in domains with gender imbalances (e.g., spatial skills and STEM). The present study explored parents' and children's gender beliefs related to both preference and ability for different toys and types of screen media. Prior research shows that parents hold gendered beliefs about play and tend to rate spatial play as more masculine (Campenni, 1999; Fisher-Thompson, 1990). Children's gendered beliefs are less studied; while children tend to play with stereotypical toys (Fisher-Thompson, 1993; Servin et al., 1999), their beliefs about toys and gender more generally have not been fully explored.

Consistent with prior research and our hypotheses, we found that parents held gendered beliefs about children's preferences for playing with spatial and non-spatial toys. Specifically, parents reported that spatial toys (blocks, building toys, puzzles) are preferred more by boys, and

non-spatial toys (books, dolls/stuffed animals, drawing materials, balls) are preferred more by girls. Parents also believed that girls are better at playing with non-spatial toys, but for spatial toys, they displayed no gendered beliefs for children's ability. Parents also did not show gendered beliefs for preference and ability with screen media. In contrast, children did not hold gendered beliefs for preference or ability for any items. Rather than holding neutral beliefs, both boys and girls showed a consistent egocentric response of choosing their own gender across all toys and screen media. When asked to choose their favorite toy, digital devices were chosen most frequently and equally by boys and girls. Girls were significantly more likely than boys to choose non-spatial toys, and although boys chose spatial toys more often than girls, boys and girls did not differ significantly for spatial toys.

Parents' ideas about toys can influence their children's experiences (Brown & Stone, 2018). For example, when adults play with boys, they use more masculine toys than feminine or gender-neutral toys; when they play with girls, they use both feminine and neutral toys more than masculine ones (Wood et al., 2002). Our findings complement this research. Parents in our study believed that boys prefer spatial toys (i.e., blocks, building toys) that have been classified as masculine in past research (Fisher-Thompson, 1990), despite believing that boys and girls are equally capable of playing with them. Similarly, parents believed non-spatial toys (i.e., balls, drawing materials) are preferred by girls and that girls are better at playing with them, including toys that have been categorized as stereotypically neutral or that ranged across categories in other studies (Blakemore & Centers, 2005; Campenni, 1999; Fisher-Thompson, 1990). The finding that parents did not believe that boys and girls differed in their ability when playing with spatial toys was unexpected and ran counter to our hypotheses, and an interesting question for future research is whether there are differential impacts of beliefs about preferences versus ability. It is

also important to note that parents in this study were not asked about their own play experiences as children, which could impact their views on the gender appropriateness of certain types of play. It is possible that the gender typicality of parents' own childhood play shaped the gendered beliefs reflected in our results.

Children did not express beliefs that boys would prefer and be better at spatial play, as predicted by our hypotheses. Instead, they displayed egocentric responses, choosing their own gender for both preference and ability questions across toys. Although unexpected, such responses are consistent with related research on children's gendered beliefs, in which young children show own-gender associations with being "really, really smart" that shift to more neutral responses for girls around age 6 (Bian, Leslie, & Cimpian, 2017). Critically, these beliefs in ability mediate gender differences in children's choice to pursue intellectually challenging activities (Bian et al., 2017). Holding egocentric beliefs about their ability to engage in spatial play, as observed in the current study, might support both boys' and girls' confidence and interest in spatial play. However, the age range of our study's participants (4 to 6 years) limits our speculations, as an older female sample might have shown a similar shift away from egocentrism.

This study asked parents and children about several popular toys and activities that ranged in gender stereotypicality. The spatial toys included blocks and building toys, which have been considered strongly masculine in prior work (Fisher-Thompson, 1990), although they have sometimes been rated as only moderately masculine (Campenni, 1999) or gender-neutral (Blakemore & Centers, 2005). The other spatial item in this study, puzzles, is often considered gender-neutral (Blakemore & Centers, 2005; Campenni, 1999; Fisher-Thompson, 1990). We chose these particular spatial toys because of their relations with spatial reasoning ability (e.g.,

Jirout & Newcombe, 2015; Levine et al., 2012; Verdine et al., 2014). In our non-spatial set, the toys have been rated across gender domains, including feminine (dolls/stuffed animals), gender-neutral (books, drawing materials), and moderately masculine (balls; Blakemore & Centers, 2005; Campenni, 1999; Fisher-Thompson, 1990; Wood et al., 2002). We chose these toys because they are common, popular, and, most importantly, do not particularly require spatial thinking in their use. However, these are just a few possible examples of spatial and non-spatial toys and many more could be considered in future research.

An important caveat is that observed gendered beliefs in this study, though statistically significant, were quite small. For the parent measure, we intentionally included a wide scale so that parents would feel comfortable giving gendered ratings that weren't extreme to avoid a social desirability bias of responding neutral. In fact, very few parents used the full scale, as evidenced by average scores ranging from − 0.27 to 0.25 on a scale of − 4 to 4. It will be important for future studies to explore how meaningful these scores are. Although it is possible that they are so close to neutral that they do not indicate a meaningful gendered belief, it is also very possible that the ratings indicate a more implicit bias that can influence parenting behaviors and socialization of children's gendered beliefs.

One of the novel contributions of this study was in measuring parents' and children's gendered beliefs for various types of screen media. The screen media that children interact with have changed significantly in recent years, with widespread and increasing use of touchscreen devices, so an examination of beliefs about these devices is important and timely (Brown & Stone, 2018; Rideout & Robb, 2020). We found that both parents and their children expressed neutral gendered beliefs about screen media (television, computers, and tablets/smartphones), and boys and girls were equally likely to choose touchscreens as their favorite toy. Indeed,

touchscreens were the most popular toy, chosen by 42% of all children. One reason for the absence of a gender bias could be because screen media serve as a platform for play, with many different options for engagement that may themselves be gendered. A computer or an iPad can be used for spatial play, with games like Minecraft, and non-spatial play, with alphabet games or e-books. Few studies have explored parents' beliefs about digital play in relation to other types, and prior work focused on general relative preference compared to other play types (Isikoglu Erdogan, Johnson, Dong, & Qiu, 2019). Thus, while it is probably not surprising that digital play is popular with children, our study provides a necessary starting point for understanding parents' and children's beliefs about digital play.

Lastly, parents rated spatial and non-spatial play as similarly educational, and both were rated as more educational than using screen media. Interestingly, parents' beliefs about the educational value of screen media and non-spatial play related to how often their children use screen media and engage in non-spatial play, respectively, but their beliefs about the educational value of spatial play were not related to play frequency. For screen media, our results are consistent with prior research showing parents' attitudes toward screen media significantly predicted how much time their children spent using such media (Cingel & Krcmar, 2013; Vandewater et al., 2007). This may be because parents hold mixed opinions about the educational value of screen media. When asked whether screen media has a positive or negative effect on children's education, parents' responses differ by the type of media, with computers viewed more positively than television and mobile devices (Isikoglu Erdogan et al., 2019; Wartella, Rideout, Lauricella, & Connell, 2013). Consistent with this research, parents in the present study rated screen media's educational value below the midpoint of the scale, suggesting that parents consider them to have some importance for learning but much less than both

physical play types. Since educational ratings were associated with children's screen media use, parents' relatively negative appraisal of screens as educational tools may lead their children to engage with screens less often than physical play. A more in-depth understanding of digital play and potential gender differences was beyond the scope of this study but understanding what children are doing when engaging with screens, as well as whether or not digital devices provide educational value, are important topics for future research to address.

The present study sought to offer a modern, nuanced evaluation of views on gender and play by asking parents about their gendered beliefs for toys and screen media during an era in which societal beliefs about gender roles are in flux. Our findings give an updated summary of how parents, as well as children, think about toys and gender, showing that these views have changed over recent years. We asked children directly about their own gendered beliefs, unlike much of the past work on gender perceptions of toys, and included screen media as an increasingly popular mode of play. In doing so, we aimed to contribute a contemporary perspective on play that could lead to positive change in children's exposure to educational toys and media. Young children practice spatial skills through play, and the spatial skills developed in early childhood can provide an important foundation for future learning, especially in STEM domains (Verdine et al., 2014). Thus, understanding children's and parents' beliefs about toys can support the development of interventions. For example, if children are receptive to spatial play regardless of their gender, such play could serve as a valuable opportunity to promote spatial development and, more broadly, engagement in STEM subjects for both girls and boys. Moreover, with screen media increasingly used in children's education, it is crucial to understand how parents and children view their educational value in order to promote learning outcomes.

Conclusion

Parents play a valuable role in providing early play experiences that can contribute to their children's development. Parent beliefs, such as about gender and toys, and related parenting behaviors, can influence children's beliefs and play opportunities. Our results suggest that, although parents hold stereotypical gendered beliefs about children's preferences for spatial and non-spatial toys, they do not believe spatial play abilities differ, and their young children do not show gendered beliefs about play with spatial and non-spatial toys. This work also provides an initial exploration of parents' and children's gendered beliefs about screen media and supports past research on parents' beliefs about their educational value. Future research should delve into parents' and children's gendered and educational beliefs about toys, activities, and media devices on a broader scale to understand how children interpret and parents can support playful learning.

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Figure 1. Example of child measure of gendered preference/ability.

Figure 2. Means and SE of parent gendered ratings of toy preference and ability by toy type

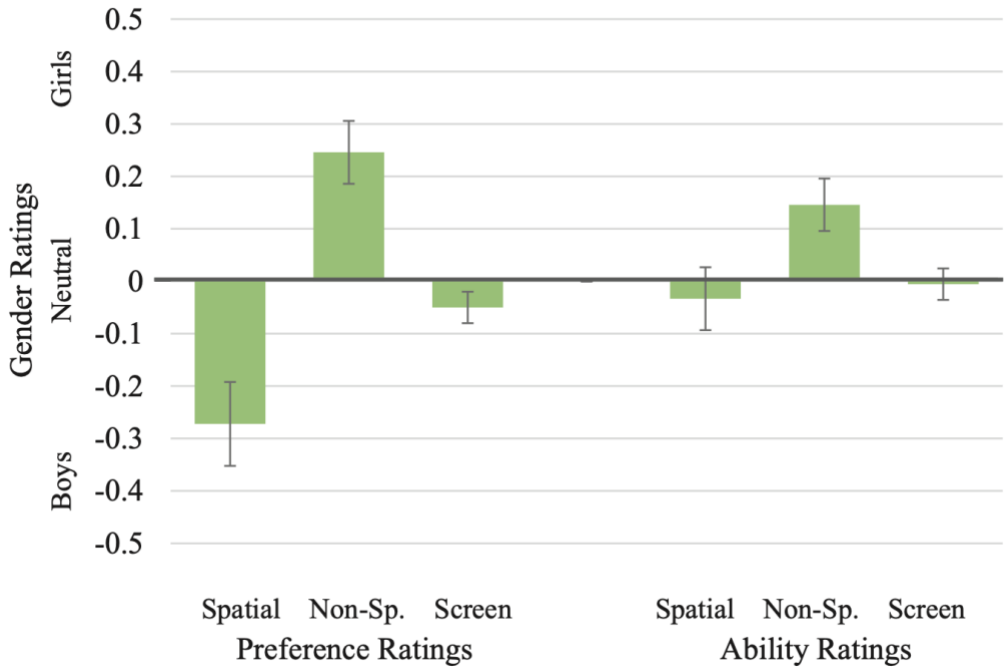
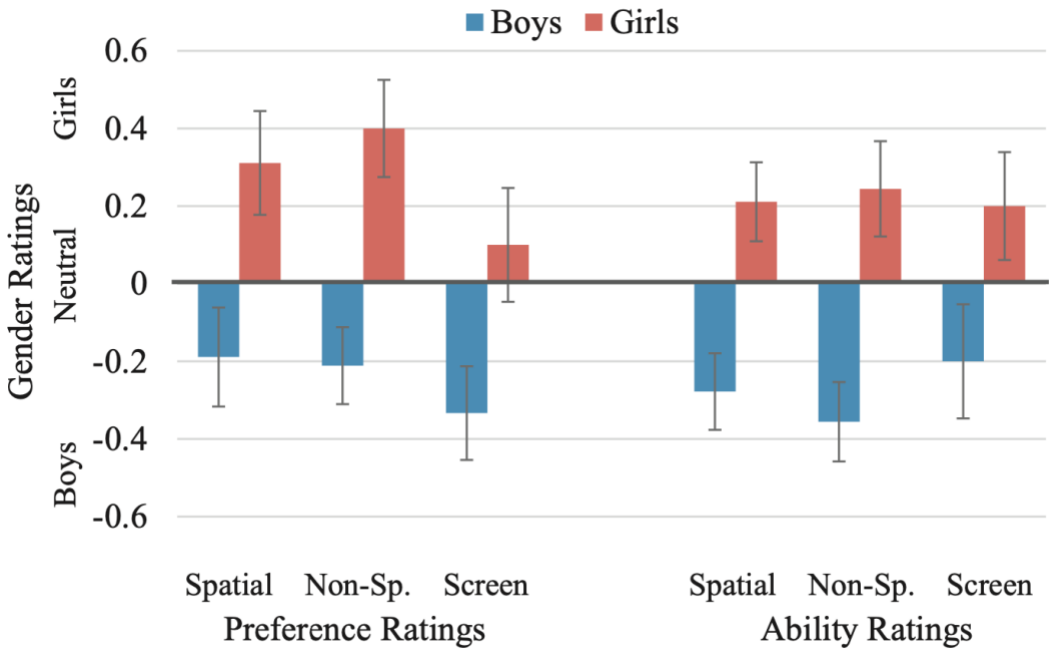


Figure 3. Means and SE of child gendered ratings of toy preference and ability by toy type



Appendix A

Parent Questionnaire

Please answer each question to the best of your knowledge. You are free to skip any questions you do not wish to answer. We understand that children's activities change often, so estimations are fine.

First, we are interested in children's preferences for toys and their abilities to engage in different playful behaviors. Please answer the following questions thinking about boys and girls in general – not your own children.

Please rate whether the following play activities are preferred more by boys or girls, in your opinion.

		Strong boy Preference				No Difference				Strong girl Preference
1.	Blocks	1	2	3	4	5	6	7	8	9
2.	Books	1	2	3	4	5	6	7	8	9
3.	Dolls/Stuffed animals	1	2	3	4	5	6	7	8	9
4.	Balls	1	2	3	4	5	6	7	8	9
5.	Outside play	1	2	3	4	5	6	7	8	9
6.	Drawing materials	1	2	3	4	5	6	7	8	9
7.	Building toys	1	2	3	4	5	6	7	8	9
8.	Puzzles	1	2	3	4	5	6	7	8	9
9.	Television	1	2	3	4	5	6	7	8	9
10.	Computers	1	2	3	4	5	6	7	8	9
11	Tablets/Smartphones:	1	2	3	4	5	6	7	8	9

Please rate whether boys or girls are more skilled in the following play activities, in your opinion.

		Strong Boy Ability				No Difference				Strong Girl Ability
12.	Blocks:	1	2	3	4	5	6	7	8	9
13.	Books:	1	2	3	4	5	6	7	8	9
14.	Dolls/Stuffed animals	1	2	3	4	5	6	7	8	9
15.	Balls:	1	2	3	4	5	6	7	8	9
16.	Outside play	1	2	3	4	5	6	7	8	9
17.	Drawing materials	1	2	3	4	5	6	7	8	9
18.	Building toys	1	2	3	4	5	6	7	8	9
19.	Puzzles:	1	2	3	4	5	6	7	8	9
20.	Television:	1	2	3	4	5	6	7	8	9
21.	Computers:	1	2	3	4	5	6	7	8	9
22	Tablets/Smartphones:	1	2	3	4	5	6	7	8	9

Please indicate how often your child plays with or uses:

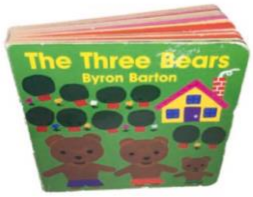
	Several times a day	Once a day	Several times a week	Once a week	Several times a month	Once a month or less
23. Blocks	☐	☐	☐	☐	☐	☐
24. Books	☐	☐	☐	☐	☐	☐
25. Dolls/Stuffed animals	☐	☐	☐	☐	☐	☐
26. Balls	☐	☐	☐	☐	☐	☐
27. Outside play	☐	☐	☐	☐	☐	☐
28. Drawing materials	☐	☐	☐	☐	☐	☐
29. Building toys	☐	☐	☐	☐	☐	☐
30. Puzzles	☐	☐	☐	☐	☐	☐
31. Television	☐	☐	☐	☐	☐	☐
32. Computers	☐	☐	☐	☐	☐	☐
33. Tablets/Smartphones	☐	☐	☐	☐	☐	☐

How important do you perceive each of the following play activities to be for learning? Please circle your response from 1 (not important at all) to10 (extremely important).

		Not important									Extremely important
34.	Blocks:	1	2	3	4	5	6	7	8	9	10
35.	Books:	1	2	3	4	5	6	7	8	9	10
36.	Dolls/Stuffed animals	1	2	3	4	5	6	7	8	9	10
37.	Balls:	1	2	3	4	5	6	7	8	9	10
38.	Outside play	1	2	3	4	5	6	7	8	9	10
39.	Drawing materials	1	2	3	4	5	6	7	8	9	10
40.	Building toys	1	2	3	4	5	6	7	8	9	10
41.	Puzzles:	1	2	3	4	5	6	7	8	9	10
42.	Television:	1	2	3	4	5	6	7	8	9	10
43.	Computers:	1	2	3	4	5	6	7	8	9	10
44.	Tablets/Smartphones:	1	2	3	4	5	6	7	8	9	10

Appendix B

Spatial and non-spatial toy images in child measure

<table>
<tr><td rowspan="2">Spatial Toys</td><td>  </td><td>  </td><td>  </td></tr>
<tr><td>  </td><td>  </td><td>  </td></tr>
<tr><td rowspan="2">Non-spatial Toys</td><td>  </td><td>  </td><td>  </td></tr>
<tr><td>  </td><td>  </td><td>  </td></tr>
<tr><td colspan="4">Which toy is your favorite?
  </td></tr>
</table>